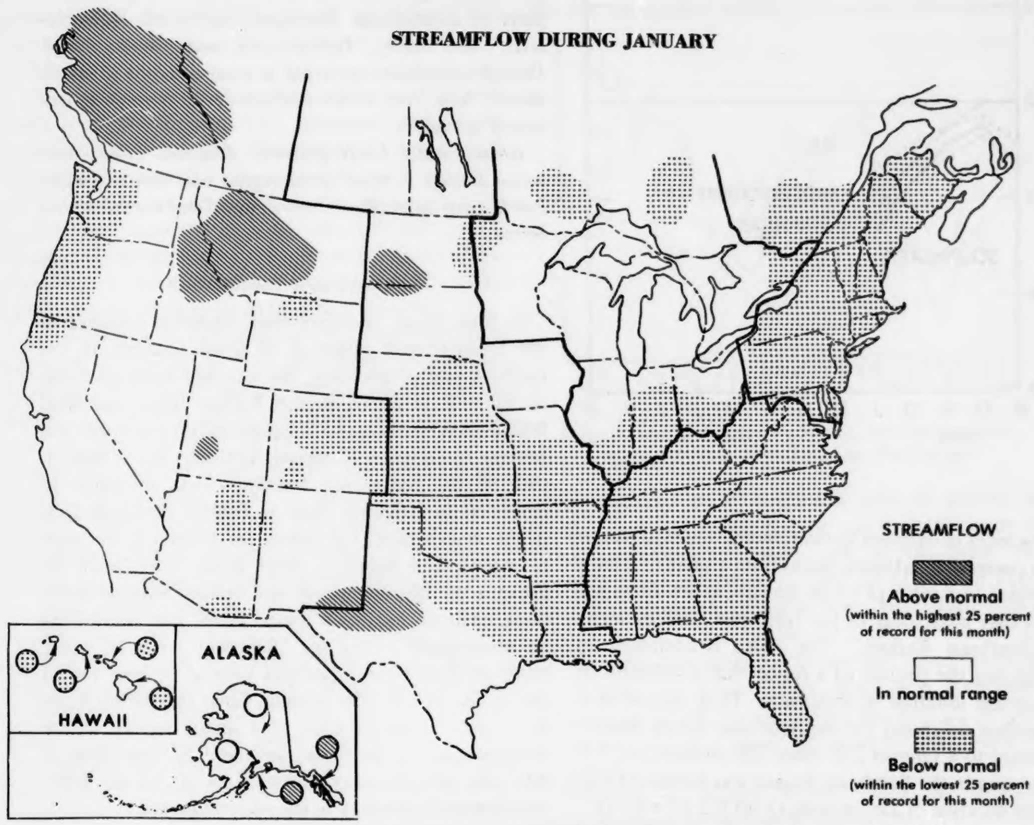
WATER RESOURCES REVIEW for

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

JANUARY 1981

STREAMFLOW DURING JANUARY



STREAMFLOW AND GROUND-WATER CONDITIONS

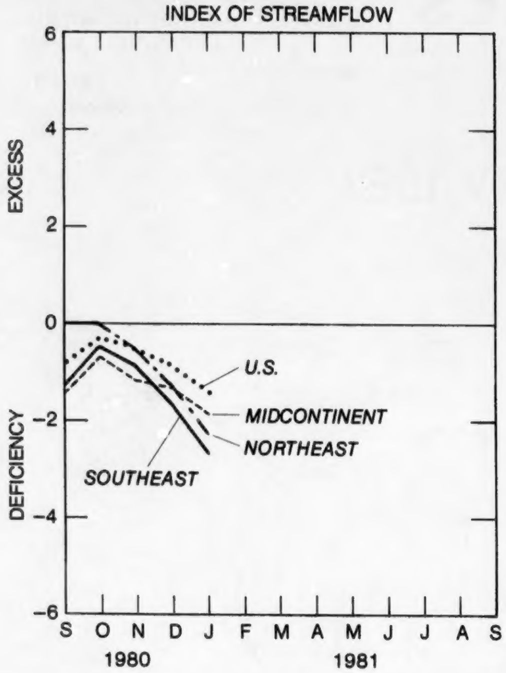
Drought conditions continued in several eastern States where end-of-month contents in many reservoirs remained far below average. Streamflow generally decreased in southern Canada and in most areas of the United States.

Monthly mean flows were below the normal range in Hawaii, coastal areas of the Pacific Northwest, and in a broad band from New Brunswick throughout the Northeast Region, the Southeast Region, and most of the southern half of the Midcontinent Region. Monthly and/or daily mean flows were lowest of record for January in parts of Connecticut, Hawaii, Louisiana, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and in parts of all States in the Southeast Region except South Carolina and Virginia.

Flows remained in the above-normal range in parts of British Columbia, Idaho, Montana, New Mexico, Texas, and Utah, and increased into that range in parts of Alberta, Alaska, and North Dakota. Monthly and daily mean flows were highest of record for the month in parts of Alaska.

Ground-water levels generally declined in the Northeast Region. Levels were below average in most of the region, and were unusually low in parts of southern New England and northern New Jersey. In the Southeast Region, levels held steady or rose in Alabama, trends were mixed in Mississippi and Georgia, and levels mostly declined elsewhere. Levels were generally above average in Kentucky, and mostly below average in other States. In the Western Great Lakes Region, levels held steady or rose in Indiana and Ohio, but generally declined elsewhere. Levels were near normal in Ohio, and mostly below normal elsewhere. In the Midcontinent Region, levels declined in North Dakota and Iowa, and rose in Arkansas; trends were mixed elsewhere in the region. Levels were about average in Iowa but generally below average in other States. In the West, levels rose in Washington and in New Mexico, and declined in Montana and in most of Idaho. Trends were mixed elsewhere. Levels were below average in Idaho, Montana, Arizona, and New Mexico, and above and below average in other States.

New high ground-water levels for January were recorded in Nevada and Utah. New January lows occurred in parts of southern New England and northern New Jersey, in Arizona, Arkansas, Georgia, Idaho, Kansas, Minnesota, Mississippi, Montana, Nevada, Tennessee, and Texas. New alltime low levels were reached in Tennessee and Texas.



The index of deficient streamflow continued to worsen in the conterminous United States from a value of 0.84 in December to a value of 1.4 in January, as low flows prevailed over large areas in the Northeast, Midcontinent, and Southeast Regions. The index is computed by multiplying the percent of a region that is deficient by the average duration of deficiency. Thus, the index of streamflow deficiency for the Southeast during January decreased to a value of 2.67 when 100 percent (i.e., 1.0) of the area in the Southeast Region was deficient for an average duration of 2.67 months (1.00 X 2.67 = 2.67).

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

Streamflow decreased throughout the region and was below the normal range except in parts of Quebec and Nova Scotia. Monthly mean discharges decreased sharply from those of last month and were lowest of record in parts of Connecticut, Maryland, New York, Massachusetts, New Jersey, Pennsylvania, and Rhode Island. Drought conditions persisted in areas adjacent to southeastern New York where reservoir levels were at or near record low levels.

Ground-water levels generally declined. Levels were below average in most of the region, and were unusually low in parts of southern New England and northern New Jersey.

STREAMFLOW CONDITIONS

In New Jersey, monthly mean discharge remained in the below-normal range at all index stations. In the northern part of the State, the monthly mean discharge of 32.0 cfs in South Branch Raritan River near High Bridge (drainage area, 65.3 square miles) was lowest for January in 63 years of record. Similarly, in the western part of the State, the monthly mean discharge of 2,440 cfs in Delaware River at Trenton (drainage area, 6,780 square miles) was lowest for January in 69 years of record. The Delaware River Basin Commission declared a drought emergency and ordered reduced diversions, reduced minimum design flows, and restrictions on nonessential water use. Reservoir levels in many northern New Jersey reservoirs were at or near record low levels. At the index station, Great Egg Harbor River at Folsom (drainage area, 56.3 square miles), in the southern part of the State, the monthly mean flow of 40.1 cfs, and the daily mean of 34 cfs on the 14th, were lowest for January in 66 years of record.

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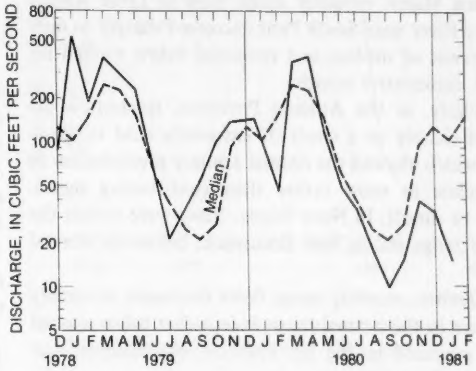
In central Maryland, low carryover flow from December held mean discharge in Seneca Creek at Dawsonville in the below-normal range for the 2d consecutive month. In the Choptank River basin in eastern Maryland, monthly mean discharge at the index station near Greensboro decreased sharply and was below the normal range for the first month since February 1980. Total freshwater inflow to Chesapeake Bay averaged about 17,800 cfs, only 21 percent of average, and lowest for January in period of record that began in 1951.

The monthly mean flow of 2,260 cfs in Potomac River near Washington, D.C. (drainage area 11,560 square miles) was only 20 percent of median, the second lowest flow for January in 50 years of record, and only 220 cfs greater than the record low for January that occurred in 1966. The low flow on the Potomac River permitted the salt wedge from Chesapeake Bay to move upstream; at monthend this wedge had moved upstream as far as Quantico, Virginia.

In southeastern Pennsylvania, the monthly mean discharge of 425 cfs in Schuylkill River at Pottstown (drainage area, 1,147 square miles), was lowest for January in 55 years of record. Water use restrictions were in effect in 290 of 696 water companies in Pennsylvania located in the Susquehanna, Delaware, and Potomac River basins. Also in eastern Pennsylvania, monthly mean discharge of Susquehanna River at Harrisburg decreased sharply to only 21 percent of median and remained in the below-normal range for the 3d consecutive month. In the western part of the State, monthly mean flows at index stations decreased into the below-normal range and ranged from 13 percent of median at Casselman River at Markleton to 42 percent of median at Allegheny River at Natrona. No significant snowmelt occurred during January and as a result, water consumption continued at a rate faster than streamflow could replace it and reservoir levels continued to drop.

Streamflow in New York generally decreased to base flow levels in January as a result of abnormally cold weather precluding any significant snowmelt. Runoff was below the normal range at all index stations and, in southeastern New York, remained in that range since September 1980, with record low flows for January occurring at several gaging stations. In the northern part of the State, where monthly mean discharge in West Branch Oswegatchie River near Harrisville was above the normal range and nearly twice the median in December, mean flow decreased sharply to less than 50 percent of median in January, and was below the normal range. On Long Island, monthly mean flow of Massapequa Creek at Massapequa decreased, contrary to the normal seasonal pattern of increasing flow, and remained in the below-normal range for the 5th consecutive month.

In northwestern Connecticut, the monthly mean discharge of 1.17 cfs, and the daily mean of 0.09 cfs on the 25th, in Burlington Brook near Burlington (drainage area, 4.13 square miles) were lowest for the month in 50 years of record. In the southwestern part of the State, monthly mean flow in Pomperaug River at Southbury (drainage area, 75.0 square miles) decreased seasonally and remained in the below-normal range for the 5th consecutive month. (See graph.) The monthly



Monthly mean discharge of Pomperaug River at Southbury, Conn. (Drainage area, 75.0 sq mi; 194.2 sq km)

mean discharge of 15.1 cfs was only 15 percent of median and was lowest for the month in 49 years of record. In the southeastern part of the State, the monthly mean discharge of 34.6 cfs in Salmon River near East Hampton (drainage area, 102 square miles) was lowest for January in 53 years of record. In northeastern Connecticut, the monthly mean discharge of 10.8 cfs in Mount Hope River near Warrenville (drainage area, 28.6 square miles) was only 22 percent of median and was lowest for January in 41 years of record.

Similarly, in adjacent Rhode Island, the monthly mean discharge of 38.4 cfs in Branch River at Forestdale (drainage area, 91.2 square miles) was only 21 percent of median and lowest for January in 42 years of record.

In Massachusetts, monthly mean flows that were lowest of record for January occurred at index stations on Ware River at Intake Works near Barre and at West Branch Westfield River at Huntington. Runoff at these index stations was 12 and 17 percent, respectively, of median.

In Vermont, the monthly mean discharge 23.8 cfs of Dog River at Northfield Falls (drainage area, 76.1 square miles) was only 33 percent of median, the 2d lowest January for period of record that began in 1934, and was only 2.3 cfs greater than the record low for January which occurred in 1940.

In New Hampshire, mean flow of Pemigewasset River at Plymouth decreased seasonally to only 44 percent of median and was below the normal range for the first time since August 1980.

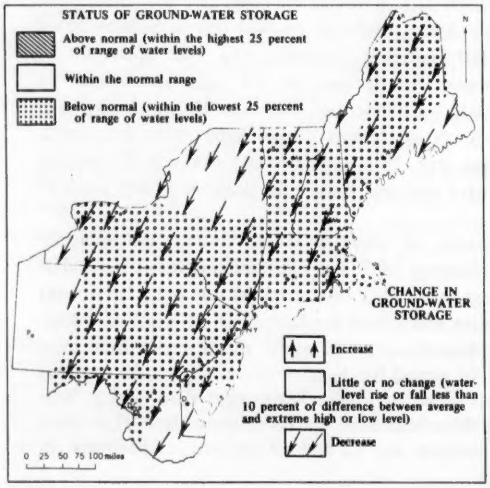
In Maine, monthly mean discharges decreased seasonally, ranged from 26 to 68 percent of median at the respective index stations, and was below the normal range over the entire State as a result of bitter cold temperatures and virtually no snowmelt. For example, in southern Maine, monthly mean flow of Little Androscoggin River near South Paris decreased sharply to only 26 percent of median and remained below median for the 3d consecutive month.

Similarly, in the Atlantic Provinces, streamflow decreased sharply as a result of extremely cold temperatures, which allowed the normal January precipitation to accumulate as snow rather than contributing significantly to runoff. In Nova Scotia, flows were within the normal range and in New Brunswick, below the normal range.

In Quebec, monthly mean flows decreased seasonally and were in the normal range except that below-normal flows prevailed in the St. Francois, St. Maurice, and Coulonge River basins.

GROUND-WATER CONDITIONS

Ground-water levels generally declined. (See map.) However, changes in levels were relatively small in parts



Map shows ground-water storage near end of January and change in ground-water storage from end of December to end of January.

of Connecticut, southeastern Massachusetts, extreme western Pennsylvania, and on Long Island, N.Y. Levels near end of January were lowest for that month in 20–30 years in observation wells in some parts of southern New England and northern New Jersey, and were generally below average in most of the Northeast region.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

Streamflow generally decreased, contrary to the normal seasonal pattern, throughout the region. Monthly mean flows were below the normal range at all index stations in each State, and were lowest of record for January in parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and West Virginia. Mean discharges have been in the below-normal range for 7 months, 6 months, and 5 months, respectively, in parts of Florida, Georgia, and Virginia, illustrating the continued lack of precipitation in those areas.

Ground-water levels declined in West Virginia, Virginia, Tennessee, and Florida, and mostly declined in Kentucky and North Carolina. Trends were mixed in Mississippi and Georgia, and levels held steady or rose in Alabama. Levels were generally above average in Kentucky and mostly below average in other States. New low levels for January were reported in Tennessee, Mississippi, and Georgia, and a new alltime low was reached in Tennessee.

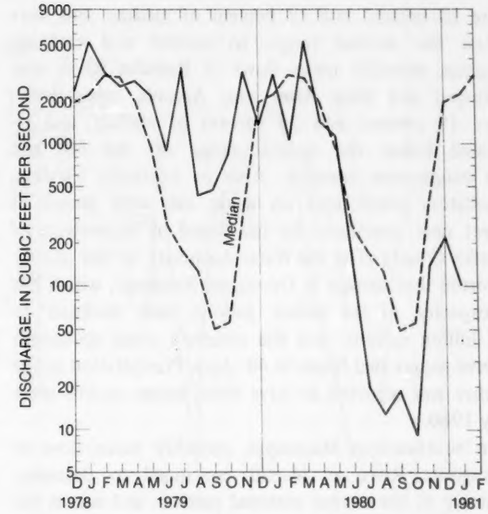
STREAMFLOW CONDITIONS

In southern and central parts of Florida, monthly mean flow in many streams was reported to be approaching historic low levels but only Miami Canal at Northwest 36th Street at Miami established a minimum mean flow (0 cfs) for January, in 22 years of record. In east-central Florida, mean flow of St. Johns River near Christmas was only 16 percent of median and remained in the below-normal range for the 7th consecutive month. In the south-central part of the State, monthly mean discharge of Fisheating Creek at Palmdale was only 6 percent of median and was below the normal range for the 7th time in the past 8 months. Cumulative runoff at these 2 stations for the first 4 months of the 1981 water year was 8 percent and 6 percent of median, respectively. In the northern part of the State, mean flows of Suwannee River at Branford and Shoal River near Crestview also were in the below-normal range, and were 66 percent and 45 percent of their respective median discharges for the month.

In the Apalachicola River basin of western Georgia, mean discharge of Flint River near Culloden decreased, contrary to the normal seasonal pattern, was only 29 percent of median, and remained in the below-normal range. Downstream, near the Georgia-Florida boundary, monthly mean flow of Apalachicola River at Chattahoochee, Fla., was only 33 percent of median and was below the normal range for the 3d consecutive month. In eastern Georgia, mean discharge of Altamaha River at Doctortown (drainage area, 13,600 square miles), decreased to 3,560 cfs, the lowest for January since records began in October 1931. In the Suwannee River basin of southeastern Georgia, monthly mean flow of Alapaha River at Statenville continued to decrease, in contrast to the normal seasonal pattern, was only 9 percent of the January median, and remained below the normal range. In extreme northern Georgia, mean discharge of Etowah River at Canton also continued to decrease and remained below the normal range.

In central Alabama, the monthly mean discharge of 413 cfs in Cahaba River at Centreville (drainage area, 1,029 square miles) was lowest for January in 54 years of record and was only one-fourth the median discharge for the month. Similarly, in the southeastern part of the State, the mean flow of 167 cfs was lowest for the month since records began in October 1937 in Conecuh River at Brantley (drainage area, 492 square miles). In west-central Alabama, mean flow of Tombigbee River at Demopolis lock and dam, near Coatopa, decreased contrary to the normal seasonal pattern, was only 21 percent of median, and was below the normal range for the first time since November 1978. In the extreme northern part of the State, mean flow of Paint Rock River near Woodville increased slightly but was only 17 percent of the January median flow and remained in the below-normal range.

In the adjacent area of west-central Tennessee, monthly mean flow of Buffalo River near Lobelville decreased into the below-normal range and was only 33 percent of median. In the east-central part of the State, the monthly mean discharge of 100 cfs in Emory River at Oakdale (drainage area, 764 square miles) was lowest for January since records began in June 1927 and was only 5 percent of median for the month. (See graph.) In north-central Tennessee, mean flow of Harpeth River near Kingston Springs decreased to 10 percent of the January median discharge and remained below the normal range. Cumulative runoff at this station for the first 4 months of the 1981 water year was only 16 percent of the median cumulative runoff for that period. In the extreme northeastern part of the State, mean flow of French Broad River below Douglas Dam decreased to 29 percent of the January



Monthly mean discharge of Emory River at Oakdale, Tenn. (Drainage area, 764 sq mi; 1,979 sq km)

median and remained in the below-normal range for the 3d consecutive month.

In southern Kentucky, the monthly mean flow of 296 cfs in Green River at Munfordville (drainage area, 1,673 square miles) was lowest for January in 55 years of record and was only 9 percent of median for the month. In the northern part of the State, mean discharge of Licking River at Catawba decreased, contrary to the normal seasonal pattern, was only 7 percent of median, and remained in the below-normal range for the 3d consecutive month.

In southeastern West Virginia, the monthly mean discharge of 282 cfs in Greenbrier River at Alderson (drainage area, 1,357 square miles) was lowest for the month since records began in July 1895, and was only 11 percent of median. In the extreme northern part of the State, the monthly mean flow of 604 cfs in Potomac River at Paw Paw (drainage area, 3,109 square miles) was lowest for January since records began in October 1938, and was only 19 percent of median. In southwestern West Virginia, mean flow of Kanawha River at Kanawha Falls decreased, contrary to the normal seasonal pattern, was only 23 percent of the January median discharge, and remained in the below-normal range.

In Virginia, monthly mean flows at all index stations were below the normal range and averaged about 20 percent of median for January. For example, in southeastern and southwestern parts of the State, mean discharges in Nottaway River near Stony Creek and

North Fork Holston River near Saltville, respectively, were 20 percent and 19 percent of median, and were below the normal range. In central and northern Virginia, monthly mean flows of Rapidan River near Culpeper and Slate River near Arvonia, respectively, were 19 percent and 24 percent of median, and remained below the normal range for the 4th and 5th consecutive months. Also in northern Virginia, mandatory restrictions on water use were placed in effect near monthend by the Board of Supervisors of Fairfax County after the Water Authority of that county reported that storage in Occoquan Reservoir, which has a capacity of 11 billion gallons, had declined to 2.8 billion gallons, and the county's usual six-month reserve supply had fallen to 40 days. Precipitation in the county was reported to have been below normal since July 1980.

In southeastern Mississippi, monthly mean flow of Pascagoula River at Merrill continued to decrease, contrary to the normal seasonal pattern, and was in the below-normal range for the first time since December 1978. In the adjacent basin of Pearl River, monthly mean discharge as measured near the Mississippi-Louisiana boundary near Bogalusa, La., decreased, in contrast to the normal seasonal pattern, and was below the normal range for the first time since April 1978. In the central part of the State, mean flow of Big Black River near Bovina (drainage area, 2,810 square miles) also decreased sharply, contrary to the normal seasonal pattern, and the mean discharge of 599 cfs was lowest for January in 45 years of record.

In North Carolina, streamflow generally declined and unusual winter drought conditions spread statewide. Flows were below the normal range throughout the State and remained in that range for the 2d consecutive month at all index stations. Mean flow ranged from about 17 percent of median at Deep River at Moncure (Lee County) to 54 percent of median at South Yadkin River near Mocksville (Rowan County). In the southwestern part of the State, the monthly mean discharge of 752 cfs (37 percent of median) in French Broad River at Asheville (drainage area, 945 square miles) was lowest for January in record that began in 1895.

In South Carolina, monthly mean flows decreased, contrary to the normal seasonal pattern of increasing flows, ranged from 37 percent of median at Pee Dee River at Peedee to 75 percent of median at North Fork Edisto River at Orangeburg, and were below the normal range statewide.

GROUND-WATER CONDITIONS

In West Virginia, ground-water levels declined statewide; levels were above average in the northwestern third of the State and below average elsewhere.

In Kentucky, levels rose slightly in the downtown Louisville area, but generally declined elsewhere, reflecting below-average precipitation. However, levels were still above average in most areas.

Levels in Virginia continued to decline statewide and were below average.

In Tennessee, levels at index stations in the central and eastern parts of the State continued to decline. Water levels at both wells were at record lows for January. In western Tennessee, the artesian level in the key well in the 500-foot sand near Memphis declined slightly and continued more than 15 feet below average; the level in this well reached a new alltime low; records began in 1941.

Levels in North Carolina declined in the mountains and in the Piedmont, and held steady in the Coastal Plain. Levels were slightly above average in the mountains, near average in the eastern Piedmont, and below average in the western Piedmont and Coastal Plain.

In Mississippi, levels in wells in the Jackson metropolitan area declined 1 to 2 feet, but levels held fairly steady in wells in the Cockfield Formation. In southern Mississippi and along the Gulf Coast, levels in key wells, including those in shallow water-table aquifers, held steady except for local declines because of nearby pumping. In the north, levels in wells in the Wilcox and Upper Cretaceous aquifers continued to rise slightly. In the Yazoo River Basin, levels in wells in the Mississippi River alluvium aquifer declined 1 to 5 feet, and record low levels for January were recorded at several index wells.

In Alabama, levels held steady or rose about a foot but continued below average.

Levels in Georgia declined slightly in the Piedmont. In the coastal counties, levels in the principal artesian aquifer rose as much as 7 feet. Near Savannah and Brunswick, levels declined as much as 4 feet and 2 feet, respectively. The artesian level in the key well in the Savannah area, on Cockspur Island, rose slightly but continued below average by more than 7 feet, and reached a new January low in 24 years of record.

In Florida, ground-water levels declined statewide. Levels declined less than a foot at Jacksonville, Pensacola, Tallahassee and near Tampa. Levels declined 5 feet near Mulberry in west-central Polk County. Levels ranged from a foot below average at Pensacola to 13 feet below average at Mulberry. In southeast Florida, levels declined about half a foot, and ranged from 0.6 foot below average in Palm Beach and St. Lucie Counties to slightly above average in south Dade County.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

Streamflow increased in northern Ohio but decreased in all other parts of the region. Monthly mean flows remained in the below-normal range in parts of Ontario and Illinois, and decreased into that range in parts of Indiana and Ohio.

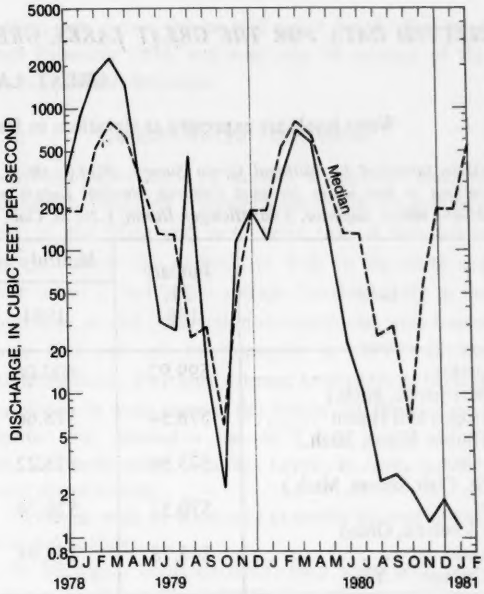
Ground-water levels generally declined in Minnesota, Wisconsin, and Michigan, held steady or rose in Indiana, and rose in Ohio. Levels were mostly below normal, but were near normal in Ohio and locally near normal in Indiana. New low levels for January were reached in Minnesota.

STREAMFLOW CONDITIONS

In northern Illinois, where monthly mean flow of Rock River near Joslin was 2 to 4 times median during the period August through December, 1980, and was above the normal range in 4 of those 5 months, mean flow decreased sharply in January, was 6 percent greater than median, and was in the normal range. In the central part of the State, mean discharge of Sangamon River at Monticello also decreased sharply to 15 percent of median, but remained within the normal range. Cumulative runoff at this station for the first 4 months of the 1981 water year was only 17 percent of median. In southern Illinois, monthly mean flow of Skillet Fork at Wayne City decreased and remained below the normal range for the 3d consecutive month. Cumulative runoff at that station for the first 4 months of the 1981 water year was only 2 percent of median. (See graph.)

In Wisconsin, monthly mean flows decreased in all parts of the State, remained within the normal range, and varied from 75 percent to 112 percent of median. For example, in northwestern Wisconsin, monthly mean discharge of Jump River at Sheldon decreased seasonally and was 75 percent of the January median, as compared with 74 percent of median during December. In the central part of the State, mean flow of Wisconsin River at Muscoda also decreased seasonally but remained above median for the 6th consecutive month, and was 112 percent of median as compared with 113 percent last month.

In Minnesota, monthly mean flows decreased seasonally in all parts of the State, remained within the normal range, and varied from 75 percent to 135 percent of median. In the central part of the State, mean flow of Crow River at Rockford continued to decrease seasonally, was 135 percent of the January median, and was greater than median for the 5th consecutive month.



Monthly mean discharge of Skillet Fork at Wayne City, Ill. (Drainage area, 464 sq mi; 1,202 sq km)

Mean flows of Mississippi River at St. Paul and Anoka were 75 percent and 76 percent of the respective January median flows for those sites, and remained within the normal range for the 5th consecutive month. In the northwestern part of the State, the mean discharge of 4.5 cfs in Roseau River at Ross (drainage area, 1,220 square miles) was 5th lowest for January in 52 years of record, and was below the normal range for the 8th time in the past 9 months. Also in this part of the State, monthly mean flows of Wild Rice River at Twin Valley and Crow Wing River at Nimrod remained below the normal range. In northeastern Minnesota, monthly mean flow of Rainy River at Manitou Rapids decreased seasonally to 97 percent of median but remained in the normal range for the 3d consecutive month. Monthend storage in the Mississippi River headwater reservoir system was 6 percent greater than at the end of December, 13 percent less than last year, 12 percent below average for the end of January, and 18 percent of capacity.

In western Ontario, monthly mean flow of English River at Umfreville continued to decrease seasonally and was below the normal range for the first time since August 1980. In the eastern part of the Province, mean discharge of Missinaibi River at Mattice also continued to decrease seasonally, was only 60 percent of median, and remained in the below-normal range. In extreme southeastern Ontario, monthly mean flow of Saugeen

(Continued on page 9.)

SELECTED DATA FOR THE GREAT LAKES, GREAT SALT LAKE, AND OTHER HYDROLOGIC SITES

GREAT LAKES LEVELS

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955

(Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations in feet above National Geodetic Vertical Datum of 1929 (NGVD), formerly called sea level datum of 1929, add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.)

Lake	January 31, 1981	Monthly mean, January		January		
		1981	1980	Average 1900–75	Maximum (year)	Minimum (year)
Superior .... (Marquette, Mich.)	599.92	600.06	600.82	600.34	601.33 (1975)	598.58 (1926)
Michigan and Huron ...... (Harbor Beach, Mich.)	578.54	578.66	579.28	577.72	579.92 (1973)	575.39 (1965)
St. Clair .... (St. Clair Shores, Mich.)	573.86	573.22	574.71	572.51	575.37 (1974)	569.86 (1936)
Erie .... (Cleveland, Ohio)	570.52	570.74	571.70	569.74	572.39 (1973)	567.62 (1935)
Ontario .... (Oswego, N.Y.)	243.78	243.94	244.30	243.99	246.10 (1946)	241.67 (1935)

LAKE WINNIPEG AT GIMLI, MANITOBA

Alltime high: 718.26 (July 1974). Alltime low: 709.62 (February 1941).	Monthly mean, January				
	1981	1980	Average 1913–80	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	712.98	713.51	713.10	716.06 (1975)	709.69 (1941)

GREAT SALT LAKE

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	January 31, 1981	January 31, 1980	January		
			Average, 1904–80	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	4,199.80	4,198.25	4,198.10	4,204.20 (1924)	4,191.90 (1964)

LAKE CHAMPLAIN, AT ROUSES POINT, N.Y.

Alltime high (1827–1980): 102.1 (1869). Alltime low (1939–1980): 92.17 (1941).	January 29, 1981	January 31, 1980	January		
			Average, 1939–78	Max. daily (year)	Min. daily (year)
Elevation in feet above NGVD:	94.90	95.14	95.36	98.37 (1974)	93.56 (1948)

FLORIDA

Site	January 1981		December 1980	January 1980
	Discharge in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	700	90	750	800
Miami Canal at Miami (southeastern Florida)	0	0	0	100
Tamiami Canal outlets, 40-mile bend to Monroe	38	110	96	178

(Continued from page 7.)

River near Port Elgin decreased sharply, was less than median for the first time since May 1980, but remained in the normal range.

In the southern part of Michigan's Lower Peninsula, monthly mean flow of Red Cedar River at East Lansing decreased sharply, contrary to the normal seasonal pattern, was less than median for the first time since July 1980, but remained in the normal range. In the northern part of the Lower Peninsula, mean flow of Muskegon River at Evart also decreased and remained in the normal range, but was greater than the median discharge for January. Also in this part of the State, monthly mean levels of Houghton Lake near Houghton Lake Heights, and Lake Mitchell-Cadillac at Cadillac were, respectively, 0.09 foot and 0.26 foot below normal for the month. In the Upper Peninsula, monthly mean flow of Sturgeon River near Sidnaw continued to decrease but was greater than median, and remained in the normal range for the 4th consecutive month. Also in the Upper Peninsula, the average monthly level of Lake Michigamme was 0.45 foot below the 25-year median level for January.

In Ohio, monthly mean flows increased seasonally and were in the normal range except in Scioto River at Higby, in the central part of the State, where mean flow decreased sharply, was below the normal range, and was only 35 percent of the January median discharge. This was the first month of mean flow in the below-normal range at Higby since February 1978. Storage at monthend in reservoirs in the Scioto River basin upstream from Higby was 1 percent greater than last month, 68 percent of a year ago, and 56 percent of normal capacity. Storage at monthend in reservoirs in the Mahoning River basin upstream from Newton Falls was 5 percent greater than last month, 95 percent of a year ago, and 37 percent of capacity.

In Indiana, monthly mean flow decreased into the below-normal range in all parts of the State and varied from 15 percent to 24 percent of median. For example, in the upper reaches of Wabash River basin, in the northeastern part of the State, mean flow of Mississinewa River at Marion decreased, contrary to the normal seasonal pattern, was below the normal range for the first time since May 1980, and was only 15 percent of the January median discharge. In the lower reaches, on the main stem, mean flow of Wabash River at Mount Carmel, Ill., also decreased, contrary to the normal seasonal pattern, was below the normal range for the first time since May 1980, and was only 24 percent of median. Similarly, in the adjacent basin of North Fork White River, mean flow at the index station at Shoals decreased sharply, in contrast to the normal seasonal pattern, was below the normal range for the first time since February 1978, and was only 16 percent of the January median discharge.

GROUND-WATER CONDITIONS

Ground-water levels in shallow water-table wells in Minnesota continued a 9-month decline in the southern part of the State and were more than 4 feet below average. Levels also declined in wells in the north and were about 2 feet below average. Levels in wells in the southwest as well as several in the northwest were lowest since the end of the drought in 1977. In the Minneapolis-St. Paul area, artesian levels showed little or no change in wells tapping the Prairie du Chien-Jordan aquifer, but showed a rise of 5 feet in the deeper Mt. Simon-Hinckley aquifer. Levels in both aquifers were above average.

Levels in wells in Wisconsin generally showed normal seasonal declines.

In Michigan, levels declined; they were well below average in the south-central and southeastern parts of the Lower Peninsula but near or above average elsewhere.

In Illinois, the level in the shallow well in glacial drift at Princeton, Bureau County, declined 1 foot but continued above average by nearly 3 feet.

Levels in wells in Indiana were generally stable but were below normal in the northwestern and central parts of the State, while in the south, where they also were below normal, levels declined until they responded to a warming trend and began to rise until month's end. Levels in wells in the lake region rose slightly at month's end and were near normal.

Levels in Ohio rose and were about normal.

MIDCONTINENT

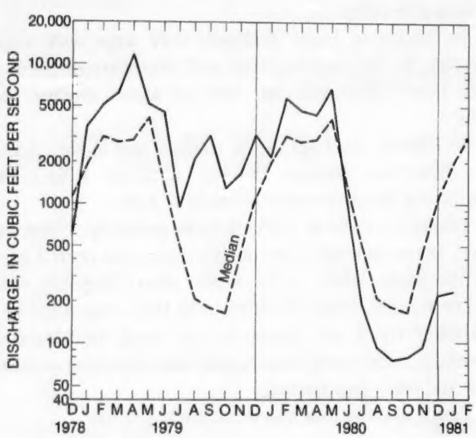
[Manitoba and Saskatchewan, Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

Streamflow increased in Saskatchewan, and in parts of Kansas, Louisiana, Nebraska, North Dakota, and Texas, but decreased elsewhere in the region. Monthly mean flows remained in the above-normal range in parts of Texas and increased into that range in parts of North Dakota. Mean flows remained in the below-normal range in parts of Arkansas, Kansas, Louisiana, Nebraska, North Dakota, and Texas, and decreased into that range in parts of Missouri. Below-normal flows have persisted in parts of North Dakota for 9 months and in parts of Kansas and Nebraska for 7 months, illustrating the continued lack of precipitation in those areas.

Ground-water levels declined in North Dakota and in Iowa, and rose in Arkansas; trends were mixed elsewhere in the region. Levels were about average in Iowa but generally below average in other States. New January lows were recorded in Kansas, Arkansas, and Texas, and a new alltime low was reached in the Texas Panhandle.

STREAMFLOW CONDITIONS

In western Texas, where monthly mean flow of North Concho River near Carlsbad was 5 times median in December, flow increased during January, was about 5½ times median, and remained in the above-normal range for the 3d consecutive month. In the northeastern part of the State, monthly mean discharge of Neches River near Rockland also increased but was only 12 percent of the January median and remained in the below-normal range for the 3d consecutive month. (See graph.) Cumulative runoff at this station for the first



Monthly mean discharge of Neches River near Rockland, Tex. (Drainage area, 3,636 sq mi, 9,417 sq km)

4 months of the 1981 water year was only 18 percent of median. Monthend records for 38 reservoirs showed that storage decreased in 26, increased in 10, and remained the same in 2.

In western Louisiana, the monthly mean discharge of 112 cfs in Calcasieu River near Oberlin (drainage area, 753 square miles) was lowest for January in 45 years of record, and was only 7 percent of median. In the northwestern part of the State, mean flow of Saline Bayou near Lucky increased seasonally but was only 22 percent of median and remained in the below-normal range. In southeastern Louisiana, monthly mean discharge of Amite River near Denham Springs decreased sharply, contrary to the normal seasonal pattern, was only 44 percent of median, and was below the normal range. The monthly mean discharge of Red River at Alexandria (drainage area, 67,500 square miles, of which 5,936 square miles is noncontributing) was 3,940 cfs, lowest for January since records began in October 1928. The monthly mean discharge of Mississippi River at Baton Rouge (drainage area, 1,243,500 square miles) was 166,300 cfs, and the daily mean on January 31 was 156,000 cfs. On January 28, at which time the flow was 165,000 cfs, the leading edge of the saltwater wedge, which moves upstream along the streambed as the freshwater flow decreases and vice versa, was reported to be at river mile 60 (measured upstream from the river's mouth), near Myrtle Grove, La., about 30 miles downstream from New Orleans.

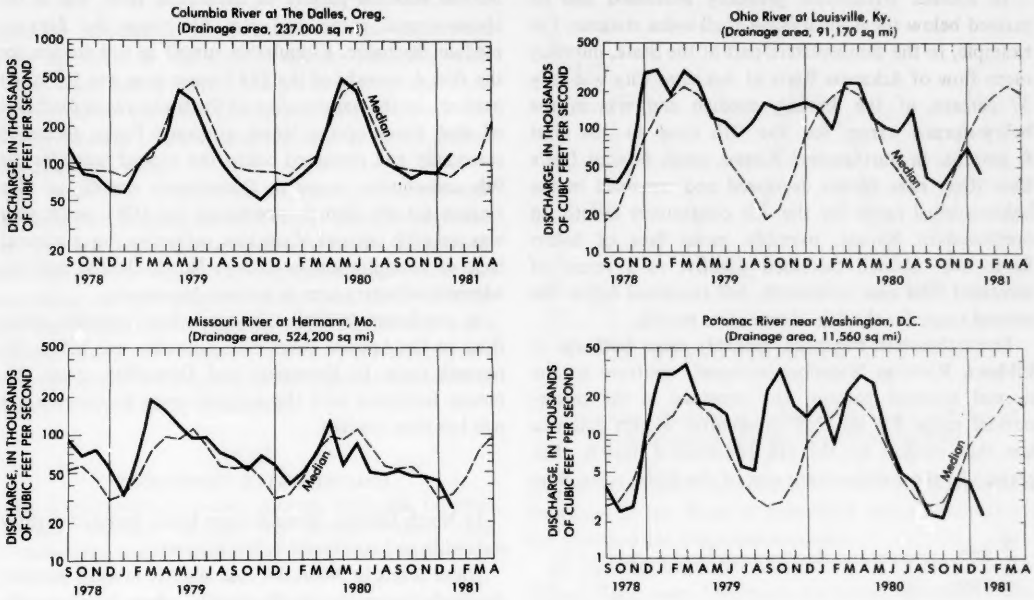
In southern Arkansas, monthly mean discharge of Saline River near Rye decreased sharply, in contrast to the normal seasonal pattern, was only 20 percent of median, and was in the below-normal range for the first time since August 1978. In the northern part of the State, mean flow of Buffalo River near St. Joe also decreased, contrary to the normal seasonal pattern, was only 9 percent of median, and remained below the normal range for the 3d consecutive month. Cumulative runoff at this station for the first 4 months of the 1981 water year was only 11 percent of median.

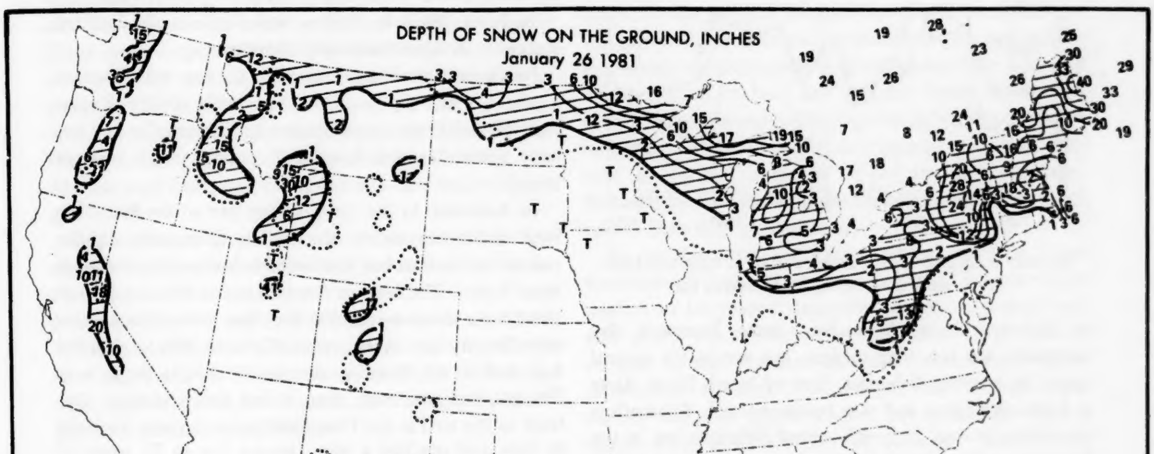
In southern Missouri, mean flow of Gasconade River at Jerome decreased, in contrast to the normal seasonal pattern, was only 35 percent of median, and was below the normal range for the 7th time in the past 9 months. In the northwestern part of the State, where monthly mean discharge of Grand River near Gallatin was 839 percent of median in December, flow decreased sharply and the mean discharge during January was only 44 percent of median but was within the normal range.

In southwestern Iowa, monthly mean flow of Nishnabotna River above Hamburg decreased, contrary to the normal seasonal pattern, was less than median for the 3d time in the past 4 months, but remained in the normal range. In the north-central part of the State, mean discharge of Des Moines River at Fort Dodge decreased and was less than median but also remained in the normal range. In eastern Iowa, monthly mean flow of Cedar River at Cedar Rapids also decreased and was in the normal range, but remained above median for the 3d consecutive month.

In southwestern Oklahoma, mean flow of Washita River near Durwood decreased sharply, was below the normal range for the 5th time in the past 6 months, and was the lowest flow observed in January at that station since 1967. In eastern Oklahoma, mean flow of Illinois River near Tahlequah was only 14 percent of average and was lowest for the month since 1964.

HYDROGRAPHS OF FOUR LARGE RIVERS

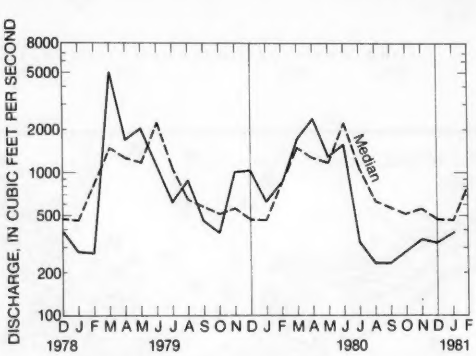




Note: This chart was prepared by the National Weather Service, NOAA, based upon preliminary telegraphic reports from regular National Weather Service stations and selected cooperative stations, supplemented by earlier measurements at selected cooperative stations. Shaded portions represent areas covered with snow; lines indicate depth in inches. No attempt is made to indicate areas and depths that may exist at high altitudes in the Rocky Mountains, beyond the firgures shown by reports from regular National Weather Service and a few special cooperative stations. Dotted line shows limits of last week's cover.

In Kansas, streamflow generally decreased and remained below the normal range at all index stations. For example, in the southwestern part of the State, monthly mean flow of Arkansas River at Arkansas City was only 37 percent of the January median and was in the below-normal range for the 7th time in the past 8 months. In northeastern Kansas, mean flow of Little Blue River near Barnes decreased and remained in the below-normal range for the 7th consecutive month. In northwestern Kansas, monthly mean flow of Saline River near Russell increased slightly, as a result of increased flow near midmonth, but remained below the normal range for the 4th consecutive month.

In northeastern Nebraska, monthly mean discharge of Elkhorn River at Waterloo increased, contrary to the normal seasonal pattern, but remained in the below-normal range for the 7th consecutive month and was less than median for the 8th consecutive month. (See graph.) In the northwestern part of the State, mean flow



Monthly mean discharge of Elkhorn River at Waterloo, Nebr. (Drainage area, 6,900 sq mi; 17,900 sq km)

of Niobrara River above Box Butte Reservoir also increased, was less than median, but was in the normal range. In western Nebraska, flow of North Platte River at Lisco decreased and was below normal. Streamflow was above normal in north-central Nebraska but in the Republican River basin in the southwestern part of the State, unregulated flows ranged from 60 percent to 80 percent of normal for the month.

In eastern South Dakota, monthly mean flow of Big Sioux River at Akron, Iowa continued to decrease seasonally but remained above median, and was in the normal range for the 11th consecutive month. In the central part of the State, mean flow of Bad River near Fort Pierre also decreased and remained within the normal range.

In southwestern North Dakota, monthly mean flow of Cannonball River at Breien increased, in contrast to the normal seasonal pattern of decreasing flow, was in the above-normal range and was 6½ times the January median discharge. Cumulative runoff at this station for the first 4 months of the 1981 water year was 2½ times median. In the eastern part of the State, mean discharge of Red River of the North at Grand Forks decreased seasonally and remained below the normal range for the 9th consecutive month. Cumulative runoff at this station for the first 4 months of the 1981 water year was only 37 percent of median, reflecting the continued lack of precipitation in eastern North Dakota and the adjacent tributary area in western Minnesota.

In southeastern Saskatchewan, where monthly mean flow of Qu'Appelle River near Lumsden was below the normal range in November and December, mean discharge increased into the normal range in January but was less than median.

GROUND-WATER CONDITIONS

In North Dakota, ground-water levels declined slightly statewide and continued below normal.

Water levels in Nebraska rose slightly in most parts of the State except in the Panhandle, where levels mostly declined. Levels continued below average statewide.

In Iowa, levels in shallow water-table wells declined statewide; levels were mostly about average.

In Kansas, trends were mixed in the key wells. Despite a slight rise, the level in the well at the Kansas Agricultural Experiment Station in Thomas County was once again at a new low for the month in 33 years of record.

In Arkansas, in the rice-growing part of the State, the level in the key well in the shallow Quaternary aquifer rose about ¾ foot but continued below average by more than 7 feet. The level in the well in the deep aquifer—the Sparta Sand—rose 9½ feet but nevertheless was a new January low in 13 years of record. The level in the key well at El Dorado, also in the Sparta Sand, rose 2¾ feet but was more than 4 feet below average. The level in the well in the Pine Bluff industrial area declined ½ foot and reached a new January low in 22 years of record.

In Louisiana, levels in most wells in the terrace and alluvial aquifers declined and were below average, in response to deficient rainfall and low streamflow. Levels in wells in the Sparta Sand and in Miocene aquifers continued seasonal declines. In the Baton Rouge area in the southeast, levels rose in all wells in the various sand aquifers. Decreased winter pumping in the New Orleans area resulted in rises of 1 to 7 feet in the Gonzales-New Orleans aquifer. Levels in wells in the Gramercy and Norco aquifers declined slightly in response to

declining Mississippi River stages. In the southwest, levels in wells in the Chicot aquifer generally rose. Trends were mixed in the rice-growing area, and levels rose in wells in the Lake Charles industrial area, and rose slightly in wells in the Evangeline aquifer in the Eunice and Opelousas areas.

In Texas, the level in the key well in the Edwards Limestone at Austin declined but was above average, and rose but was below average at San Antonio. At Houston, the level in the well in the Evangeline aquifer rose but was below average. Despite a 3-foot rise, the level in the key well in the bolson deposits at El Paso was at a new January low in 16 years of record. A new alltime low was recorded in the key well in the Ogallala formation at Plainview in the Texas Panhandle.

WEST

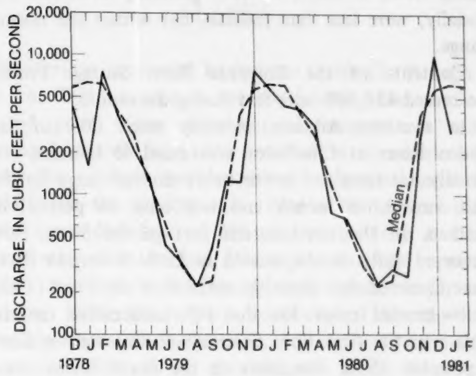
[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

Streamflow decreased in Alberta, British Columbia, Colorado, Idaho, Nevada, Washington, and Wyoming, and was variable elsewhere in the region. Monthly mean flows remained in the below-normal range in parts of Colorado and Arizona, and decreased into that range in parts of California, Oregon, Washington, and Wyoming. Monthly mean discharges remained in the above-normal range in parts of British Columbia, Idaho, Montana, New Mexico, and Utah, and increased into that range in parts of Alberta.

Ground-water levels rose in Washington and New Mexico, and declined in Montana and in most of Idaho. Elsewhere in the region, trends were mixed. Levels were below average in Idaho, Montana, Arizona, and New Mexico, and above and below average in other States. New high levels for January were reached in Nevada and Utah, and new lows for January were recorded in Idaho, Montana, Nevada, and Arizona.

STREAMFLOW CONDITIONS

In Washington, monthly mean discharges decreased, contrary to the normal seasonal pattern of increasing flows, and were below the normal range in Skykomish River near Gold Bar and Chehalis River near Grand Mound, a sharp contrast from the above-normal streamflow in December. In the southwestern part of the State, mean flow of Chehalis River near Grand Mound was only 45 percent of median as a result of below-normal precipitation during the month. (See graph.) In the eastern part of the State, monthly mean flow of Spokane River at Spokane decreased but remained above



Monthly mean discharge of Chehalis River near Grand Mound, Wash. (Drainage area, 895 sq mi; 2,318 sq km)

median as a result of snowmelt runoff. Storage in all reservoirs in the State at monthend was above that of last year and the long-term average.

In north-coastal Oregon, monthly mean flow in Wilson River near Tillamook decreased seasonally, was only 33 percent of median, and was below the normal range. In the western part of the State, mean flow of Willamette River at Salem decreased sharply, contrary to the normal seasonal pattern of increasing flow, was only 34 percent of median, and was also below the normal range. In southwestern Oregon, monthly mean discharge of Umpquá River near Elkton decreased to only 21 percent of median and was below the normal range. Streamflow increased slightly at monthend as a result of runoff from light precipitation.

In north-coastal California, where monthly mean discharge of Smith River near Crescent City was above median in December, mean flow decreased sharply and was below the normal range, and only 37 percent of median during January. In other parts of the State, streamflows at index stations generally increased seasonally and were below median but within the normal range. Combined contents of 10 index reservoirs in northern and central California at month's end were 112 percent of average and 98 percent of the contents one year ago.

In north-central Nevada, where monthly mean flow of Humboldt River at Palisade was above the normal range from May 1980 through December 1980, mean flow decreased, contrary to the normal trend, and was within the normal range at 149 percent of median.

In southwestern Utah, mean flow of Beaver River near Beaver increased, contrary to the normal seasonal pattern of decreasing flow, to 145 percent of median, and remained in the above-normal range for the 8th consecutive month. Elsewhere in the State, monthly

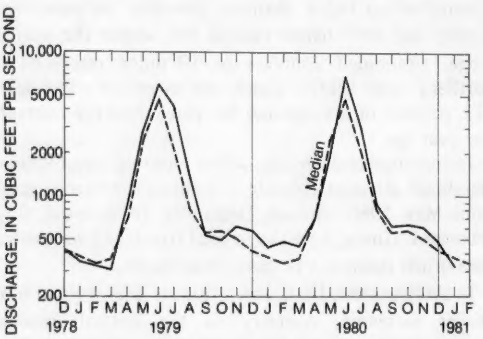
mean flows at index stations generally decreased seasonally, were less than median, but within the normal range.

Contents of the Colorado River Storage Project decreased 438,580 acre-feet during the month.

In southern Arizona, monthly mean flow of San Pedro River at Charleston continued to increase seasonally but remained in the below-normal range for the 7th consecutive month and was only 56 percent of median. In the northeastern part of the State, flow occurred early in the month in Little Colorado River near Cameron but monthly mean flow remained in the below-normal range for the 4th consecutive month. This was the first flow observed at this station since September 1980. Elsewhere in the State, mean flows were near or above median and within the normal range.

In southeastern New Mexico, monthly mean discharge of Delaware River near Red Bluff increased, contrary to the normal seasonal trend, remained in the above-normal range for the 3d consecutive month, and was 233 percent of median. In the southwestern part of the State, where monthly mean flow of Gila River near Gila was below the normal range and 86 percent of median in December, mean flow increased seasonally, remained below median, but was within the normal range. Monthly mean flows at index stations in the northern part of the State decreased seasonally but remained in the normal range.

In central Colorado, east of the Continental Divide, mean flow of Bear Creek at Morrison decreased sharply and was below the normal range for the first month since March 1979. Also in central Colorado, but west of the Divide, where monthly mean discharge in Roaring Fork River at Glenwood Springs was above the normal range and 114 percent of median in December, flow decreased seasonally to 86 percent of median in January and was below the normal range. (See graph.) In the



Monthly mean discharge of Roaring Fork River at Glenwood Springs, Colo. (Drainage area, 1,451 sq mi; 3,758 sq km)

southwestern part of the State, monthly mean flow of Animas River at Durango continued to decrease seasonally and was below the normal range for the first time since January 1980. In the northwestern part of the State, mean flow of Yampa River at Steamboat Springs also continued to decrease seasonally and remained in the below-normal range for the 3d consecutive month.

In northern Wyoming, monthly mean flow of Tongue River near Dayton decreased seasonally and was below the normal range. Elsewhere in the State, mean flows were generally in the normal range.

In the Snake River basin in southern Idaho, monthly mean flows at both index stations decreased and were near or slightly below median. In the north-central areas of the State, monthly mean discharges of Salmon River at White Bird and Clearwater River at Spalding decreased seasonally but remained in the above-normal range for the 2d consecutive month. Reservoir storage was well above average except in southeastern Idaho where storage was slightly below average.

West of the Continental Divide in northwestern Montana, mean flow in Clark Fork at St. Regis decreased seasonally but remained in the above-normal range for the 2d consecutive month. Also in northwestern Montana, monthly mean flow of Middle Fork Flathead River near West Glacier decreased seasonally but was nearly 3 times the January median flow and remained in the above-normal range for the 3d consecutive month. Also in northwestern Montana, monthly mean discharge of Marias River near Shelby increased, contrary to the normal seasonal trend, was 252 percent of median, and was above the normal range for the first time since March 1979. In the Yellowstone River basin, mean flow at Yellowstone River at Billings continued to decrease seasonally but remained in the above-normal range for the 2d consecutive month and was 109 percent of median.

In western Alberta, monthly mean discharge of Bow River at Banff continued to decrease seasonally, but was above the normal range and 113 percent of the median flow for January.

In southern British Columbia, high carryover flow from December held monthly mean discharge in Fraser River at Hope in the above-normal range for the 2d consecutive month. In the adjacent basin of Skeena River, monthly mean flow decreased seasonally at the index station at Usk, was 1½ times the January median flow, and was in the above-normal range.

GROUND-WATER LEVELS

In Washington, the artesian ground-water level in the key well in Tacoma, in the western part of the State, rose more than 12 feet and was more than 4 feet above

average. The level in the well in Spokane Valley, in eastern Washington, rose more than 3 feet but was a little more than ½ foot below average.

In Idaho, the level in the sand and gravel water-table aquifer in the Boise Valley declined slightly and was slightly below average. In the non-artesian observation wells representative of the Snake River Plain aquifer, the level in the key well in the eastern part held steady, reaching the January low of 1980, and was more than 2½ feet below average. In the key well at Gooding, the level declined about 1½ feet and was nearly 4 feet below average. The level in the well at Rupert rose slightly but was at a new January low in 30 years of record. At Eden, the level declined 1¾ feet and was more than 7 feet below average, reaching a new low for January in 23 years of record. The level in the water-table well in the alluvial aquifer underlying the Rathdrum Prairie, in northern Idaho, declined nearly ½ foot and was below average by nearly 9 feet.

In Montana, the level in the key water-table wells declined and were below average. The level in the well at Hamilton Fairgrounds declined 2½ feet, reaching a new January low in 10 years of record.

In southern California, in Santa Barbara County, the level in the key well at Lompoc, in Santa Ynez Valley, rose but was below average. The level in the well in Upper Cuyama Valley declined but was above average. In the Santa Maria Valley well, the level rose slightly and continued above average. The level in the well at Baldwin Park, in Los Angeles County, declined and continued below average by about 12 feet.

In Nevada, the levels in key wells in Paradise and Steptoe Valleys rose and were above average, with a new January high in the Steptoe Valley well in 30 years of record. At Truckee Meadows, the level in the key well declined slightly and continued below average. The level in the Las Vegas Valley well rose but nevertheless was at a new January low in 34 years of record.

In Utah, levels in wells in the Flowell and Holladay areas rose but continued below average. The level declined in the key well in the Logan area, but continued above average. In the Blanding area, the level in the key well rose, reaching a new January high in 20 years of record.

In Arizona, a new January low in 30 years of record was reached in the observation well in the Elfrida area, despite a slight rise. Another new January low was reported at another well. At the City of Tucson No. 2 observation well, the level declined and was below average. Levels rose in two other index wells.

In New Mexico, levels rose in all observation wells, but continued below average.

ALASKA

Streamflow continued to decrease seasonally throughout the State except in the southeastern and south-central parts where above-normal temperatures and increased runoff from rain resulted in above-normal flows. For example, in the southeastern coastal basin of Gold Creek, the monthly mean flow of 93 cfs, and the daily mean discharge of 325 cfs on the 16th at the index station at Juneau (drainage area, 9.76 square miles) were highest for January since records began in October 1946. Similarly, in south-central Alaska, the monthly mean discharge of 2,116 cfs, and the daily mean of 3,800 cfs on the 18th, in Kenai River at Cooper Landing (drainage area, 634 square miles) were highest for the month since records began in May 1947. In the interior, the monthly mean flow of Tanana River at Nenana decreased seasonally but was in the above-normal range as a result of high carryover flow from December. Elsewhere in the State, monthly mean flows decreased seasonally and remained in the normal range.

Ground-water levels along the Chugach foothills, in the eastern part of the Anchorage bowl, generally declined less than 2 feet. Water levels for the rest of the Anchorage bowl rose between ½ and 1½ feet over last month.

HAWAII

Streamflow decreased seasonally at all index stations in the State and was lowest of record for the month in some areas. For example, on the island of Kauai, the monthly mean discharge of 14.9 cfs in East Branch of North Fork Wailua River near Lihue (drainage area, 6.27 square miles) was lowest for January in 66 years of record. Similarly, on the island of Hawaii, the mean discharge of 0.10 cfs in Waikea Stream near Mountain View (drainage area, 17.4 square miles) was lowest for the month in 51 years of record. On the island of Maui, monthly mean discharge of Honopou Stream near Huelo was only 20 percent of median and remained in the below-normal range. On the island of Oahu, mean flow of Kalihi Stream near Honolulu also decreased to 20 percent of median and was below the normal range.

On Guam, Marianna Islands, monthly mean flow of Ylig River near Yona decreased seasonally and was less than median but remained within the normal range for the 4th consecutive month.

Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JANUARY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	January data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean, in °C	Minimum, in °C	Maximum, in °C
	NORTHEAST										
01463500	Delaware River at	1981	2,430	119	141	884	758	995	0	0	0
	Trenton, N.J.	1945–80	13,600	62	201	......	998	20,800	.....	0	7.5
	(Morrisville, Pa.)	(Extreme yr)		(1951, 1960)	(1959)		(1965)	(1976)			
			[c]10,240								
04264331	St. Lawrence River at	**1981	236,000	165	165	105,000	93,700	111,000	0.5	0	1.5
	Cornwall, Ontario, near	1976–80	238,900	166	168	108,000	90,000	139,000	0.5	0	3.0
	Massena, N.Y.	(Extreme yr)		(1976–78, 1980)	(1976-77, 79, 80)		(1977, 1979)	(1980)			
	median streamflow at		[c]223,000								
	Ogdensburg, N.Y.										
	SOUTHEAST										
07289000	Mississippi River at	1981	176,000	267	299	136,000	128,000	148,000	4.0	2.5	5.5
	Vicksburg, Miss.	1976–80	646,200	157	246	339,000	138,000	501,000	3.5	0	9.0
		(Extreme yr)		(1979)	(1978)		(1977)	(1978)			
			[c]535,400								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam	***1981	92,600	203	223	......	45,700	67,000	.....	.....	.....
	53, near Grand Chain, Ill.	1955–80	370,200	98	382	......	28,500	448,000	.....	0	10.0
	(25 miles west of Paducah,	(Extreme yr)		(1973)	(1964)		(1956)	(1970)			
	Ky.; streamflow station		[c]315,300								
	at Metropolis, Ill.)										
	MIDCONTINENT										
06934500	Missouri River at Hermann,	1981	25,100	272	537	31,500	18,100	36,400	2.5	0	5.5
	Mo. (60 miles west of St.	1976–80	34,360	159	553	40,400	26,400	68,800	1.0	0	4.5
	Louis, Mo.)	(Extreme yr)		(1976)	(1977)		(1980)	(1980)			
			[c]32,940								
	WEST										
14128910	Columbia River at	1981	207,000	93	109	58,200	42,000	78,400	5.5	5.0	9.0
	Warrendale, Oreg.	1976–80	164,100	76	114	42,600	24,300	67,400	3.5	0	8.0
	(streamflow station	(Extreme yr)		(1978)	(1979)		(1979)	(1979)			
	at The Dalles, Oreg.)		[c]112,300								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1941–70, for comparison with data for current month.
*Dissolved-solids and water-temperature records are for 22 days only.
**Water-temperature records are for 16 days only.
***Water-temperature records not available.

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JANUARY 1981

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Dec. 1980	End of Jan. 1981	End of Jan. 1980	Average for end of Jan.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	62	65	67	57	226,300 (a)
QUEBEC					
Allard (P)	89	63	65	43	280,600 ac-ft
Gouin (P)	82	73	82	55	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	57	45	42	49	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	55	41	51	36	3,330 mcf
Lake Francis (FPR)	75	53	57	51	4,326 mcf
Lake Winnipesaukee (PR)	65	53	66	57	7,220 mcf
VERMONT					
Harriman (P)	66	49	58	46	5,060 mcf
Somerset (P)	73	58	57	59	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	63	59	76	71	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	50	39	37	44	34,270 mcf
Indian Lake (FMP)	73	54	66	53	4,500 mcf
New York City reservoir system (MW)	37	28	85	......	547,500 mg
NEW JERSEY					
Wanaque (M)	27	16	106	78	27,730 mg
PENNSYLVANIA					
Allegheny (FPR)	30	19	18	30	51,400 mcf
Pymatuning (FMR)	81	80	84	83	8,191 mcf
Raystown Lake (FR)	50	52	66	50	33,190 mcf
Lake Wallenpaupack (PR)	56	39	62	52	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	76	71	100	88	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	87	79	83	78	12,580 mcf
Narrows (Badin Lake) (P)	79	74	100	97	5,616 mcf
High Rock Lake (P)	35	23	87	70	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	77	74	83	64	70,300 mcf
Lakes Marion and Moultrie (P)	63	62	71	68	81,100 mcf
SOUTH CAROLINA––GEORGIA					
Clark Hill (FP)	55	51	70	59	75,360 mcf
GEORGIA					
Burton (PR)	57	55	68	56	104,000 ac-ft
Sinclair (MPR)	80	88	100	81	214,000 ac-ft
Lake Sidney Lanier (FMPR)	47	46	64	54	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	70	64	74	68	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	18	14	43	35	1,156,000 cfsd
Douglas Lake (FPR)	12	8	12	13	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	45	38	43	42	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	32	28	46	33	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	34	23	45	40	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	82	51	58	43	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	72	49	49	34	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	17	18	21	21	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	75	74	85	83	22,700,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	69	71	93	74	127,600 ac-ft
Bell Fourche (I)	31	36	46	48	185,200 ac-ft
Lake Francis Case (FIP)	53	63	62	65	4,834,000 ac-ft
Lake Oahe (FIP)	72	74	81	......	22,530,000 ac-ft
MIDCONTINENT REGION––Continued					
SOUTH DAKOTA––Continued					
Lake Sharpe (FIP)	103	100	102	97	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	100	97	95	93	477,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	77	79	80	71	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	75	75	87	82	2,378,000 ac-ft
Keystone (FPR)	76	83	90	87	661,000 ac-ft
Tenkiller Ferry (FPR)	84	85	95	89	628,200 ac-ft
Lake Altus (FIMR)	22	20	64	50	133,000 ac-ft
Lake O'The Cherokees (FPR)	75	75	76	78	1,492,000 ac-ft
OKLAHOMA––TEXAS					
Lake Texoma (FMPRW)	88	87	91	87	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	28	28	36	43	386,400 ac-ft
Canyon (FMR)	93	93	93	74	385,600 ac-ft
International Amistad (FIMPW)	89	89	96	84	3,497,000 ac-ft
International Falcon (FIMPW)	80	85	90	76	2,668,000 ac-ft
Livingston (IMW)	88	89	104	81	1,788,000 ac-ft
Possum Kingdom (IMPRW)	94	89	87	96	570,200 ac-ft
Red Bluff (PI)	23	24	27	31	307,000 ac-ft
Toledo Bend (P)	81	81	92	83	4,472,000 ac-ft
Twin Buttes (FIM)	38	43	42	31	177,800 ac-ft
Lake Kemp (IMW)	44	44	54	86	268,000 ac-ft
Lake Meredith (FMW)	19	19	27	37	821,300 ac-ft
Lake Travis (FIMPRW)	99	99	88	79	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	89	86	45	52	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	103	94	64	81	5,022,000 ac-ft
Lake Chelan (PR)	74	70	38	44	676,100 ac-ft
Lake Cushman	97	89	79	83	359,500 ac-ft
Lake Merwin (P)	94	103	99	96	245,600 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	69	74	50	63	1,235,000 ac-ft
Coeur d'Alene Lake (P)	173	81	35	49	238,500 ac-ft
Pend Oreille Lake (FP)	60	83	34	52	1,561,000 ac-ft
IDAHO––WYOMING					
Upper Snake River (8 reservoirs) (MP)	72	66	66	66	4,401,000 ac-ft
WYOMING					
Boysen (FIP)	78	76	73	70	802,000 ac-ft
Buffalo Bill (IP)	75	76	50	64	421,300 ac-ft
Keyhole (F)	51	51	75	45	190,400 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	62	61	58	46	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	14	17	7	15	364,400 ac-ft
Taylor Park (IR)	53	52	69	55	106,200 ac-ft
Colorado–Big Thompson project (I)	71	70	66	55	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	86	85	80	......	31,620,000 ac-ft
UTAH––IDAHO					
Bear Lake (IPR)	75	74	68	56	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	64	62	63	53	1,000,000 ac-ft
Hetch Hetchy (MP)	47	33	57	30	360,400 ac-ft
Isabella (FIR)	41	40	52	24	568,100 ac-ft
Pine Flat (FI)	73	73	76	50	1,001,000 ac-ft
Clair Engle Lake (Lewiston) (P)	74	78	79	76	2,438,000 ac-ft
Lake Almanor (P)	85	83	67	48	1,036,000 ac-ft
Lake Berryessa (FIMW)	82	82	77	82	1,600,000 ac-ft
Millerton Lake (FI)	50	55	77	65	503,200 ac-ft
Shasta Lake (FIPR)	74	76	83	70	4,377,000 ac-ft
CALIFORNIA––NEVADA					
Lake Tahoe (IPR)	44	44	30	50	744,600 ac-ft
NEVADA					
Rye Patch (I)	79	82	53	54	194,300 ac-ft
ARIZONA––NEVADA					
Lake Mead and Lake Mohave (FIMP)	89	90	88	67	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	62	62	76	17	1,073,000 ac-ft
Salt and Verde River system (IMPR)	71	71	84	40	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	35	35	43	82	330,100 ac-ft
Elephant Butte and Caballo (FIPR)	53	55	41	29	2,453,000 ac-ft

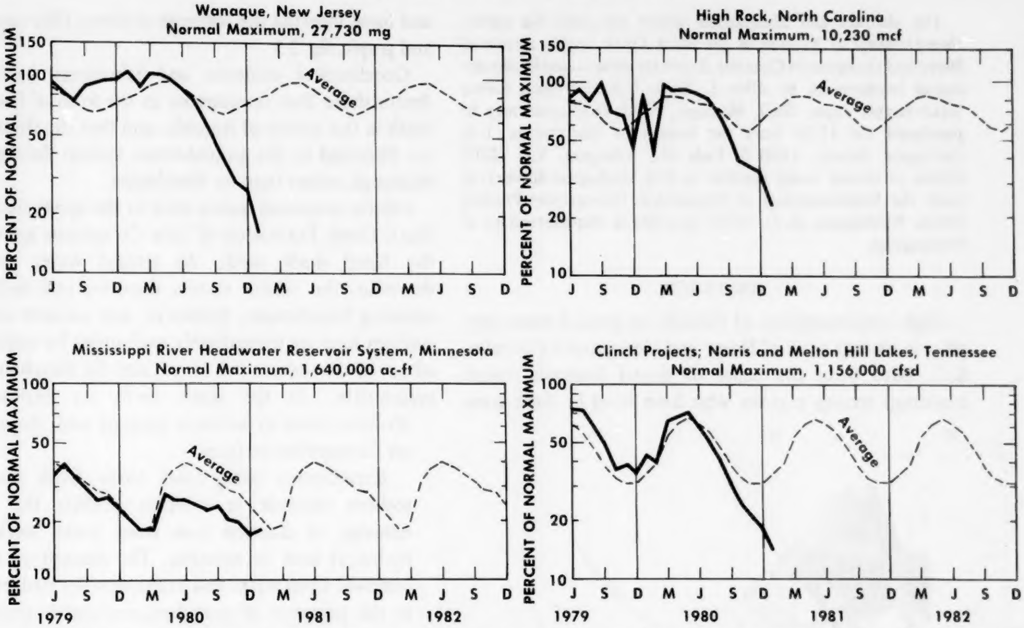
[a]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

FLOW OF LARGE RIVERS DURING JANUARY 1981

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1975 (cfs)	January 1981					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Charge in discharge from previous month (percent)	Discharge near end of month		
							(cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine	5,690	9,549	1,923	68	-70	1,350	870	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,853	973	55	-49	543	351	23
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,630	1,895	42	-52	......	......	...
1–4635	Delaware River at Trenton, N.J	6,780	11,630	2,440	24	-36	2,600	1,680	29
1–5705	Susquehanna River at Harrisburg, Pa	24,100	34,200	6,330	21	-58	6,330	4,090	26
1–6465	Potomac River near Washington, D.C	11,560	[1]11,190	2,260	20	-45	2,470	1,600	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C	4,810	5,007	1,900	36	+3	1,440	930	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,657	3,710	37	-11	2,300	1,490	27
2–2260	Altamaha River at Doctortown, Ga	13,600	13,780	3,560	25	-15	2,870	1,850	28
2–3205	Suwannee River at Branford, Fla	7,880	6,970	2,760	66	-15	2,680	1,730	31
2–3580	Apalachicola River at Chattahoochee, Fla	17,200	22,330	8,360	33	0	8,360	5,400	31
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	22,570	6,081	21	-56	4,200	2,710	29
2–4895	Pearl River near Bogalusa, La	6,630	9,263	3,128	39	-43	3,640	2,350	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1]19,210	9,304	42	-53	10,100	6,530	26
3–0850	Monongahela River at Braddock, Pa	7,337	[1]12,360	4,182	25	-61	5,400	3,490	26
3–1930	Kanawha River at Kanawha Falls, W.Va	8,367	12,530	3,562	23	-22	4,550	2,940	28
3–2345	Scioto River at Higby, Ohio	5,131	4,513	1,324	35	-45	3,840	2,480	30
3–2945	Ohio River at Louisville, Ky[2]	91,170	114,100	45,200	31	-37	47,200	30,500	27
3–3775	Wabash River at Mount Carmel, Ill	28,635	27,030	5,340	24	-30	6,000	3,900	31
3–4690	French Broad River below Douglas Dam, Tenn	4,543	[1]6,794	2,285	29	-19	......	......	...
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,185	3,242	94	-3	......	......	...
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	241,100	236,000	106	-6	240,000	155,000	31
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,300	3,920	47	-52	25,000	16,200	30
5–0825	Red River of the North at Grand Forks, N. Dak	30,100	2,524	292	38	-15	310	200	31
5–1335	Rainy River at Manitou Rapids, Minn	19,400	12,950	9,010	97	-11	9,250	5,980	23
5–3300	Minnesota River near Jordan, Minn	16,200	3,412	445	92	-28	395	255	29
5–3310	Mississippi River at St. Paul, Minn	36,800	[1]10,580	3,377	75	-20	2,950	1,910	30
5–3655	Chippewa River at Chippewa Falls, Wis	5,600	5,110	2,450	89	-19	......	......	...
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,613	6,270	112	-2	......	......	...
5–4465	Rock River near Joslin, Ill	9,551	5,852	3,640	106	-43	2,850	1,840	31
5–4745	Mississippi River at Keokuk, Iowa	119,000	62,570	30,465	92	-25	30,500	19,700	31
6–2145	Yellowstone River at Billings, Mont	11,796	6,986	2,810	109	-16	2,570	1,660	31
6–9345	Missouri River at Hermann, Mo	524,200	79,750	25,060	76	-42	23,500	15,200	22
7–2890	Mississippi River at Vicksburg, Miss[4]	1,140,500	573,600	176,000	33	-44	169,000	109,000	26
7–3310	Washita River near Durwood, Okla	7,202	1,414	186	41	-54	172	111	31
7–2765	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	724	419	91	-14	380	246	31
9–3150	Green River at Green River, Utah	40,600	6,366	1,722	94	-29	......	......	...
11–4255	Sacramento River at Verona, Calif	21,257	19,150	14,821	58	+11	26,500	17,100	27
13–2690	Snake River at Weiser, Idaho	69,200	18,170	15,200	102	-7	15,310	9,900	28
13–3170	Salmon River at White Bird, Idaho	13,550	11,290	5,736	136	-11	5,130	3,320	28
13–3425	Clearwater River at Spalding, Idaho	9,570	15,570	12,590	191	-13	10,890	7,040	29
14–1057	Columbia River at The Dalles, Oreg[5]	237,000	194,600	122,200	147	+40	......	......	...
14–1910	Willamette River at Salem, Oreg	7,280	23,810	18,640	34	-62	15,800	10,200	27
15–5155	Tanana River at Nenana, Alaska	25,600	23,850	6,948	107	-14	6,900	4,460	31
8MF005	Fraser River at Hope, British Columbia	83,800	96,400	62,850	184	-5	62,150	40,170	29

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

USABLE CONTENTS OF SELECTED RESERVOIR AND RESERVOIR SYSTEMS, JUNE 1979 TO JANUARY 1981



Abnormally low contents continued to characterize reservoirs in various parts of the Northeast and Southeast Regions, including three of the four reservoirs and reservoir systems shown on the above graphs.

WATER RESOURCES REVIEW

January 1981

Based on reports from the Canadian and U.S. field offices; completed February 12, 1981

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for January based on 20 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for January 1981 is compared with flow for January in the 30-year reference period 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for January is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the January flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of January. Water level in each key observation well is compared with average level for the end of January determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of December to the end of January.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

GEOCHEMISTRY OF FLUORIDE IN THE BLACK CREEK AQUIFER SYSTEM OF HORRY AND GEORGETOWN COUNTIES, SOUTH CAROLINA—AND ITS PHYSIOLOGICAL IMPLICATIONS

The abstract and illustrations below are from the report, *Geochemistry of fluoride in the Black Creek aquifer system of Horry and Georgetown Counties, South Carolina—and its physiological implications,* by Allen L. Zack: U.S. Geological Survey Water-Supply Paper 2067, 40 pages, 1980. This report may be purchased for $2.50 from the Branch of Distribution, U.S. Geological Survey, 1200 S. Eads St., Arlington, VA 22202 (check or money order payable to U.S. Geological Survey); or from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402 (payable to Superintendent of Documents).

ABSTRACT

High concentrations of fluoride in ground-water supplies in certain areas of Horry and Georgetown Counties, S.C., have been the cause of dental fluorosis (tooth mottling) among persons who have lived in these areas and have ingested the water as children. (See map, fig. 1, and graph, fig. 2.)

Geochemical evidence and laboratory experiments demonstrate that fluorapatite in the form of fossil shark teeth is the source of fluoride, and that the fluoride ions are liberated to the ground-water system through anion exchange, rather than by dissolution.

Calcite-cemented quartz sand in the upper third of the Black Creek Formation of Late Cretaceous age contains the fossil shark teeth. As ground water progresses downdip, the calcite matrix dissolves and hydrolyzes, releasing bicarbonate, hydroxyl, and calcium ions. The calcium ions are immediately exchanged for sodium ions adsorbed on sodium-rich clays, and the bicarbonate ions accumulate. As the shark teeth are exposed, the hydroxyl ions in solution exhange with fluoride ions on fluorapatite surfaces.

Experiments using fossil shark teeth show that sodium chloride in solution inhibits the rate of exhange of fluoride ions from tooth surfaces for hydroxyl ions in solution. The amount of fluoride removed from water and exchanged for hydroxyl ions in the presence of pure hydroxylapatite (hog teeth) was greater in saline water than in freshwater.

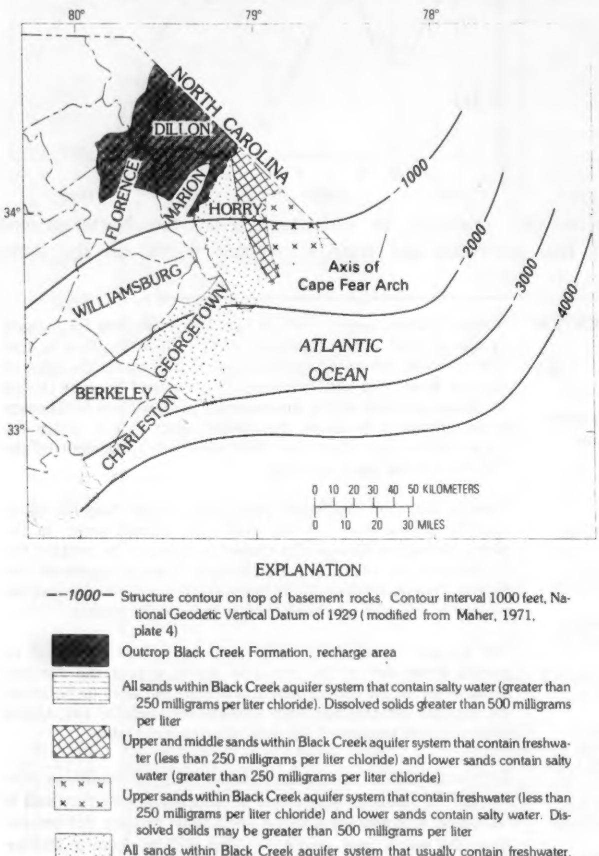

Figure 1.—Structure contours of the basement rocks, Cape Fear arch, location of the Black Creek Formation outcrop, and general water quality in the Black Creek aquifer system.

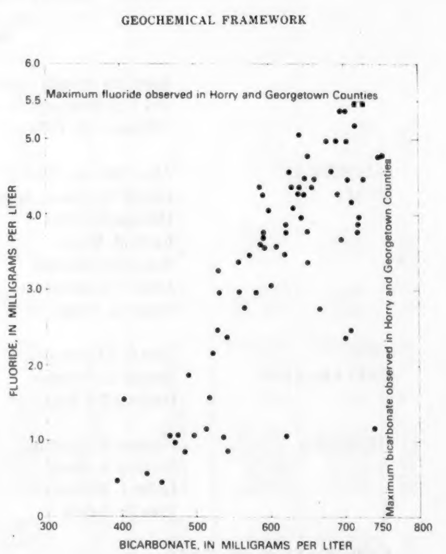

Figure 2.—Relation of fluoride and bicarbonate in water from the Black Creek aquifer system.

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